Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1-108. (Cancelled)

109. (Previously presented) A method of microfabricating an elastomeric structure, comprising:

microfabricating a first elastomeric layer having a recess formed therein that forms a flow channel, and a deflectable membrane formed integral with the first elastomeric layer, wherein the flow channel and deflectable membrane are formed from a single piece of elastomeric material;

microfabricating a second elastomeric layer having a recess formed therein, wherein the deflectable membrane is deflected to close the flow channel in response to an actuation force from the recess in the second elastomeric layer;

positioning the second elastomeric layer on top of the first elastomeric layer; and,

bonding a bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer.

110. (Original) The method of claim 109 wherein the first and second elastomeric layers are microfabricated by replication molding.

111. (Original) The method of claim 109 wherein the first and second elastomeric layers are microfabricated by laser cutting.

112. (Original) The method of claim 109 wherein the first and second elastomeric layers are microfabricated by chemical etching.

113. (Previously presented) The method of claim 109 wherein the first and second elastomeric layers are microfabricated by sacrificial layer methods.

114. (Original) The method of claim 109 wherein the first and second elastomeric layers are microfabricated by injection molding.

115. (Original) The method of claim 109 wherein:

the first elastomeric layer is fabricated on a first micromachined mold having at least one raised protrusion which forms at least one recess in the bottom of the first elastomeric layer; and

the second elastomeric layer is fabricated on a second micromachined mold having at least one raised protrusion which forms at least one recess in the bottom of the first elastomeric layer.

116. (Original) The method of claim 115 wherein the first micromachined mold has at least one first raised protrusion which forms at least one first channel in the bottom surface of the first elastomeric layer.

117. (Original) The method of claim 116 wherein the second micromachined mold has at least one second raised protrusion which forms at least one second channel in the bottom surface of the second elastomeric layer.

118. (Original) The method of claim 117 wherein a bottom surface of the second elastomeric layer is bonded onto a top surface of the first elastomeric layer such that the at least one second channel is enclosed between the first and second elastomeric layers.

119. (Original) The method of claim 116 further comprising positioning the first elastomeric layer on top of a planar substrate such that the at least one first channel is enclosed between the first elastomeric layer and the planar substrate.

120. (Previously presented) The method of claim 119 wherein a hermetic seal is formed between the bottom of the first layer and the top of the planar substrate.

121. (Original) The method of claim 109 further comprising:

microfabricating an nth elastomeric layer; and

bonding the bottom surface of the (n-1)th elastomeric layer onto a top surface of the nth elastomeric layer.

122. (Original) The method of claim 109 further comprising:

sequential addition of further elastomeric layers, whereby each layer is added by:

microfabricating a successive elastomeric layer; and

bonding the bottom surface of the successive elastomeric layer onto a top surface of the elastomeric structure.

Claim 123. (Cancelled).

124. (Original) The method of claim 109 wherein at least one of the first elastomeric layer and the second elastomeric layer are fabricated from a material selected from the group consisting of:

elastomeric compositions of polyisoprene, polybutadiene, polychloroprene, polyisobutylene, poly(styrene-butadiene-styrene), the polyurethanes, and silicones.

125. (Previously presented) The method of claim 109 wherein at least one of the first elastomeric layer and the second elastomeric layer are fabricated from a material selected from the group consisting of:

poly(bis(fluoroalkoxy)phosphazene), poly(carborane-siloxanes), poly(acrylonitrile-butadiene) (nitrile rubber), poly(1-butene), poly(chlorotrifluoroethylene-vinylidene fluoride) copolymers, poly(ethyl vinyl ether), poly(vinylidene fluoride), and poly(vinylidene fluoride – hexafluoropropylene) copolymer.

126. (Previously presented) The method of claim 109 wherein at least one of the first elastomeric layer and the second elastomeric layer are fabricated from a composition selected from the group consisting of:

polyvinylchloride (PVC), polysulfone, polycarbonate, polymethylmethacrylate (PMMA), and polytertrafluoroethylene.

127. (Previously presented) The method of claim 124 wherein at least one of the first elastomeric layer and the second elastomeric layer are fabricated from a material selected from the group consisting of polydimethylsiloxane (PDMS), and aliphatic urethane diacrylates.

128. (Original) The method of claim 109 wherein the first elastomeric layer has an excess of a first chemical species and the second elastomeric layer has an excess of a second chemical species.

129. (Original) The method of claim 128 wherein the elastomeric layers comprise thermoset elastomers which are bonded together by heating above an elastic/plastic transition temperature of at least one of the first and second elastomeric layers.

130. (Original) The method of claim 128 wherein the first and second chemical species comprise different molecules.

131. (Original) The method of claim 128 wherein the first and second chemical species comprise different polymer chains.

132. (Original) The method of claim 128 wherein the first and second chemical species comprise different side groups on the same type of polymer chains.

133. (Original) The method of claim 128 wherein the first chemical species forms bonds with the second chemical species when at least one chemical species is activated.

134. (Original) The method of claim 133 wherein the at least one chemical species is activated by light.

135. (Original) The method of claim 133 wherein the at least one chemical species is activated by heat.

136. (Original) The method of claim 133 wherein the at least one chemical species is activated by the addition of a third chemical species.

137. (Original) The method of claim 136 wherein the at least one chemical species diffuses through the elastomer structure.

138. (Original) The method of claim 128 wherein the first and second elastomeric layers are formed of different elastomeric materials.

139. (Original) The method of claim 128 wherein the first and second elastomeric layers are initially composed of the same elastomeric material, and an additional elastomeric material is added to one of the first and second layers.

140. (Original) The method of claim 128 wherein the first and second elastomeric layers are composed of the same component materials, but differ in the ratio in which the component materials are mixed together.

141. (Original) The method of claim 140 wherein each of the elastomeric layers is made of two-part silicone.

142. (Original) The method of claim 141 wherein each elastomeric layer comprises an addition cure elastomer system.

143. (Original) The method of claim 141 wherein the silicone comprises two different reactive groups and a catalyst.

144. (Original) The method of claim 143 wherein the first reactive group comprises silicon hydride moieties, the second reactive group comprises vinyl moieties, and the catalyst comprises platinum.

145. (Previously presented) The method of claim 144 wherein each elastomeric layer comprises a two-part addition-cure silicone rubber having a part A that contains vinyl groups and a catalyst and a part B that contains silicon hydride (Si-H) groups.

146. (Original) The method of claim 145 wherein the first elastomeric layer is mixed with a ratio of less than 10A:1B (excess Si-H groups) and the second elastomeric layer is mixed with a ratio of more than 10A:1B (excess vinyl groups).

147. (Original) The method of claim 146 wherein the first elastomeric layer has a ratio of 3A:1B (excess Si-H groups) and the second elastomeric layer has a ratio of 30A:1B (excess vinyl groups).

148. (Original) The method of claim 128 wherein each of the elastomeric layers are made of polyurethane.

149. (Previously presented) The method of claim 148 wherein the polyurethane comprises an aliphatic urethane diacrylate.

150. (Original) The method of claim 109 wherein the first and second elastomeric layers are made of the same material.

151. (Original) The method of claim 150 wherein at least one of the first and second elastomeric layers are incompletely cured.

152. (Original) The method of claim 150 wherein both the first and second elastomeric layers comprise a crosslinking agent.

153. (Original) The method of claim 152 wherein the crosslinking agent is activated by light.

154. (Original) The method of claim 152 wherein the crosslinking agent is activated by heat.

155. (Original) The method of claim 152 wherein the crosslinking agent is activated by an additional chemical species.

156. (Original) The method of claim 150 wherein the elastomeric layers comprise thermoset elastomers which are bonded together by heating above an elastic/plastic transition temperature of at least one of the first and second elastomeric layers.

157. (Original) The method of claim 109 wherein the first and second layers are bonded by a layer of adhesive.

158. (Original) The method of claim 157 wherein the adhesive comprises an uncured elastomer which is cured to bond the first and second elastomeric layers together.

159. (Original) The method of claim 158 wherein the adhesive comprises the same material as at least one of the first or second elastomeric layers.

160. (Original) The method of claim 109 wherein at least one of the elastomeric layers further comprises a conductive portion.

161. (Original) The method of claim 160 wherein the conductive portion is made by metal deposition.

162. (Original) The method of claim 161 wherein the conductive portion is made by sputtering.

163. (Original) The method of claim 161 wherein the conductive portion is made by evaporation.

164. (Original) The method of claim 161 wherein the conductive portion is made by electroplating.

165. (Original) The method of claim 161 wherein the conductive portion is made by electroless plating.

166. (Original) The method of claim 161 wherein the conductive portion is made by chemical epitaxy.

167. (Original) The method of claim 160 wherein the conductive portion is made by made by carbon deposition.

168. (Original) The method of claim 167 wherein the conductive portion is made by mechanically rubbing material directly onto the elastomeric layer.

169. (Original) The method of claim 167 wherein the conductive portion is made by exposing the elastomer to a solution of carbon particles in solvent.

170. (Original) The method of claim 169 wherein the solvent causes swelling of the elastomer.

171. (Original) The method of claim 169 wherein the elastomer comprises silicone and the solvent comprises a chlorinated solvent.

172. (Original) The method of claim 167 wherein the conductive portion is made by electrostatic deposition.

173. (Original) The method of claim 167 wherein the conductive portion is made by a chemical reaction producing carbon.

174. (Original) The method of claim 160 wherein the conductive portion is made by:

patterning a thin layer of metal on a flat substrate;

adhering the elastomeric layer onto the flat substrate; and

peeling the elastomeric layer off the flat substrate, such that the metal sticks to the elastomeric layer and comes off the flat substrate.

175. (Original) The method of claim 174 wherein the adhesion of the metal to the flat substrate is weaker than the adhesion of the metal to the elastomer.

176. (Original) Method of claim 160 wherein the conductive portion is patterned.

177. (Original) The method of claim 176 wherein the conductive portion is patterned by masking a surface of the conductive portion with a patterned sacrificial material.

178. (Original) The method of claim 176 wherein the conductive portion is patterned by:

depositing a sacrificial material on one of the elastomeric layers,

patterning the sacrificial material,

depositing a thin coat of conductive material thereover, and

removing the sacrificial material.

179. (Original) The method of claim 176 wherein the conductive portion is patterned by masking the surface with a shadow mask.

180. (Original) The method of claim 179 wherein the conductive portion is patterned by:

positioning a shadow mask adjacent to an elastomeric layer;

depositing a thin coat of conductive material through apertures in the shadow mask; and

removing the shadow mask.

181. (Original) The method of claim 176 wherein the conductive portion is patterned by etching.

182. (Original) The method of claim 181 wherein the conductive portion is patterned by:

depositing a mask layer onto one of the elastomeric layers;

patterning the mask layer;

etching the conductive portion through holes in the mask layer; and

removing the mask layer.

183. (Original) The method of claim 160 wherein the conductive portion is produced by doping the elastomer with a conductive material.

184. (Original) The method of claim 183 wherein the conductive material comprises a metal.

185. (Original) The method of claim 183 wherein the conductive material comprises carbon.

186. (Original) The method of claim 183 wherein the conductive material comprises a conductive polymer.

187. (Original) The method of claim 183 wherein the elastomer used is inherently conductive.

188. (Original) The method of claim 160 further comprising sealing the microfabricated elastomeric structure onto a flat substrate, wherein the flat substrate comprises at least one conductive portion.

189. (Original) The method of claim 188 wherein the flat substrate is covered by an insulating layer.

Claims 190-291 (Cancelled).

292. (Previously presented) A method of microfabricating an elastomeric structure, comprising:

microfabricating a first elastomeric layer having a recess formed therein that forms a flow channel, and a deflectable membrane formed integral with the first elastomeric layer, wherein the flow channel and deflectable membrane are formed from a single piece of elastomeric material;

microfabricating a second elastomeric layer having a recess formed therein that forms a control channel, wherein a long axis in the control channel is substantially parallel to a

bottom surface of the second elastomeric layer, and wherein the deflectable membrane is deflectable in response to an actuation force in the control channel;

positioning the second elastomeric layer on top of the first elastomeric layer; and,

bonding the bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer.

293. (Previously presented) A method of microfabricating an elastomeric structure, comprising:

microfabricating a first elastomeric layer having a plurality of recesses formed therein that form a plurality of flow channels, and a plurality of deflectable membranes formed integral with the first elastomeric layer, wherein the flow channels and deflectable membranes are formed from a single piece of elastomeric material;

microfabricating a second elastomeric layer having a recess formed therein that forms a control channel, wherein the plurality of deflectable membranes are deflected in response to an actuation force from the control channel;

positioning the second elastomeric layer on top of the first elastomeric layer; and,

bonding a bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer.